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(11) **EP 1 151 676 A1**

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.11.2001 Bulletin 2001/45

(51) Int Cl.7: **A23L 1/164**

(21) Application number: **00201548.5**

(22) Date of filing: **01.05.2000**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

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(54) **Cereal bar**

(57) Ready-to-eat food bar consisting of agglomerated particles of one or more cooked cereal bases main-

ly comprising amylaceous materials and possibly milk solids which are coated with a binder mainly comprising sugars, milk solids, humectants and fat.

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Description

[0001] The present invention relates to a ready-to-eat food bar and to a process for manufacturing it.

The state of the art

[0002] US4650685 (Persson et al.) discloses a biscuit comprising agglomerated granules of a cooked-extruded base coated with a binder, the base comprising from 40 to 80 parts by weight of cereal flour, up to 20 parts sucrose and from 0.5 to 3 parts of oil or fat, and the binder comprising from 8 to 30 parts by weight of sucrose and/or mixtures of glucose and its polymers.

[0003] WO89/04121 (HEINZ SCHAAF OHG) discloses a process for manufacturing cereals by cooking-extruding a mixture of cereal material, vegetable and/or fruits with a partial amount of sugar and milk, cutting the expanded rope of cooked-extruded mixture into pieces having a large surface, spraying an aqueous suspension of sugar and milk onto the just cut, hot and moist pieces, coating the moistened pieces with a remaining part of components in powder form and drying the coated pieces.

The objects of the invention

[0004] A first object of the present invention is to provide a ready-to-eat food bar mainly comprising amylaceous material, sugars and possibly milk solids, which is nutritionally valuable and which has a soft texture while retaining the crunchiness of cereal.

[0005] A second object of the present invention is to provide a process for manufacturing such a ready-to-eat food bar.

The invention

[0006] To this end, the present ready-to-eat food bar consists of agglomerated particles of one or more cooked cereal bases mainly comprising amylaceous materials and possibly milk solids which are coated with a binder mainly comprising sugars, milk solids, humectants and fat.

[0007] The present process for manufacturing a ready-to-eat food bar consists of preparing a dry mixture of particles of one or more cooked cereal bases mainly comprising amylaceous materials and possibly milk solids, mixing the dry mixture with a binder mainly comprising sugars, milk solids, humectants and fat and forming the mass thus obtained into a bar shape.

[0008] It has surprisingly been found that it was possible in this way to provide a food bar which is ready-to-eat, namely ready to be eaten by scrunching it just as it is, which is nutritionally valuable and which has a soft texture while retaining the crunchiness of cereal.

General description of the food bar

[0009] In the present context, the expression "being nutritionally valuable" may be understood as designating a food bar based on amylaceous materials and sugar especially comprising, in % by weight, from 5.5 to 27.5% of milk solids non fat and from 2.5 to 25% of milk fat and/or vegetable fat, that means a food bar based on amylaceous materials and sugar which is rich in milk protein and calcium.

[0010] However, as a whole, beside relatively small amounts of each of residual water, ash, dietary fibers, vitamins and minerals, the present food bar may generally comprise, in % by weight, from about 4 to 12% of protein, from about 50 to 80% of available carbohydrate and from about 2.5 to 25% of fat, for example.

[0011] The expression "has a soft texture while retaining the crunchiness of cereal" means that the cereal particles are crunchy within the bar while the binder, namely the continuous phase of the bar is soft.

[0012] The expression "particles of cooked cereal bases" covers any possible kind of cereal in piece form such as rolled cereals, gun puffed grains, cereal flakes and/or cooked-extruded cereals, for example.

[0013] The term "food bar" means "food product having a massive shape which can be eaten by hand", no limit being set as to the choice of the shape which can be a bar as well as a stick, a ball, a heart, a star, a bear or a banana, for example.

[0014] The present food bar may comprise from 5.5 to 27.5% of milk solids non fat, from 2.5 to 25% of milk fat and/or vegetable fat, from 30 to 60% of amylaceous material, from 5 to 30% of sugars, from 2.5 to 15% of humectants and from 1.0 to 7.0% of residual water.

[0015] The present food bar may further comprise up to 3% of additional calcium, preferably in form of calcium carbonate or milk calcium, in addition to the calcium already present in the milk solids non fat, for example.

[0016] The food bar may also further comprise added vitamins, minerals and/or a source of dietary fibers, for example.

[0017] The milk solids may be incorporated into the food bar in two parts, a first part being incorporated into the cooked cereal basis and a second part being incorporated into the binder, or in one part incorporated into the binder, for example.

[0018] The milk solids non fat in the cooked-extruded bases may be powdered skimmed milk, for example.

[0019] The milk solids in the binder may be milk solids from fresh milk, milk solids from condensed milk and/or milk powder, for example.

[0020] The milk fat and/or vegetable fat may be butter oil and/or vegetable fat such as partially hydrogenated sunflower or rape seed fat having a melting point of from 33 to 39°C, for example.

[0021] The amylaceous material may be a cereal flour, a starch and/or maltodextrin, for example.

[0022] The cereal flour may be wheat, barley, oat, rice

and/or corn flour, for example.

[0023] The starch may be a native starch from wheat, barley, rice and/or corn, especially high amylose starch, for example.

[0024] The sugars may be sucrose, dextrose, fructose, glucose sirup, invert sugar and/or maltose sirup in dry or liquid form, for example.

[0025] The possible source of fiber material may be a cereal bran, for example.

[0026] Beside sugars and milk solids, the binder comprises humectants and it may further comprise emulsifiers, for example.

[0027] The humectants may be glycerol and/or sorbitol, for example.

[0028] The emulsifier may be one or more mono- or di-glycerides of edible fatty acids, especially of vegetable origin, or lecithin, for example.

[0029] Natural and/or artificial antioxydants may also be added in order to prolonge the shelflife of the bar, such as tocopherols, BHA, BHT and mixtures thereof, for example.

General description of the process for manufacturing the food bar

[0030] As stated above, the present process for manufacturing a ready-to-eat food bar consists of preparing a dry mixture of particles of one or more cooked cereal bases mainly comprising amylaceous materials and milk solids, mixing the dry mixture with a binder mainly comprising sugars, milk solids, humectants and fat and forming the mass thus obtained into a bar shape.

Preparing particles of cooked cereal bases

[0031] Particles of cooked cereal bases may be any of those known to the man skilled in the art as rolled cereals, gun puffed grains, cereal flakes and/or cooked-extruded cereals, for example.

[0032] Rolled cereals may be prepared by cooking grains (whole or grits) with a liquor comprising sugar, malt, salt and vitamins, partially drying, rolling and flaking them, for example.

[0033] Puffed grains may be prepared by puffing whole grains of wheat or rice in a gun or in an oven, for example.

[0034] Cereal flakes may be prepared by cooking cereal grits or grains with a liquor, forming pellets out of the cooked mass thus obtained, rolling, toasting and possibly coating them with sugar, for example.

[0035] Cooked-extruded cereals may be prepared by cooking-extruding-expanding a mixture mainly comprising amylaceous materials and possibly milk solids, thus obtaining a rope of a thermo plastic mass having a porous texture, cutting the rope into pieces and possibly coating them with sugar, for example.

[0036] Preferred cooked-extruded-expanded cereals may be prepared by cooking-extruding-expanding at

120 to 170°C under 40 to 160 bar for 5 to 50 s a mixture comprising, in parts by weight, up to 27.5 parts of milk solids non fat, up to 12.5 parts of milk fat and/or vegetable fat, from 50 to 90 parts of amylaceous material, up to 12 parts of sugars, and added water up to a water content of from 11 to 19% by weight of the mixture, thus obtaining a rope of a thermo plastic mass having a porous texture, cutting the rope into pieces and optionally drying them.

[0037] The mixture may be prepared by first mixing together powdery components to obtain a dry mix and then mixing together the dry mix and liquid or fluid components.

[0038] This mixing step may be carried out in a first mixing section of a traditional food extruder, especially a twin screw extruder, for example.

[0039] Cooking the mixture may then be carried out in subsequent sections of the extruder where the mixture is heated, compressed and sheared so that it forms a cooked thermo plastic mass.

[0040] The thermo plastic mass may be extruded by having it pushed by the extruder screw or twin screw through the openings of a die provided for at an end of the extruder.

[0041] The die may have one or more circular openings having of from 2 to 5 mm in diameter, for example.

[0042] The thermo plastic mass may be expanded by extruding it through the die into an open space at ambient temperature and at atmospheric pressure, for example.

[0043] Water is lost in form of steam escaping the thermoplastic mass during expansion so that the rope thus obtained has a porous texture and may have a water content of from 5 to less than 11%, for example.

[0044] Cutting into pieces the thus obtained rope of expanded thermoplastic mass may be carried out by a two or more blade cutter rotating adjacent to the die openings, for example.

[0045] Drying the pieces may be carried out on a belt dryer with hot air, for example.

[0046] Preferably, the dried pieces are then coated with a sugar solution and dried again. The coating step may be carried out in a tumbler where a sugar solution may be sprayed onto the tumbling pieces, for example.

[0047] The sugar solution may comprise from 50 to 60% sugar, from 3 to 10% dextrose, from 0.5 to 1.5% oil and from 10 to 40%, especially from 25 to 35% water. It may also comprise cocoa powder, sodium chloride and aroma, for example.

[0048] The amount of sugar solution to be used may be such that the weight proportion of coating on the coated pieces is from 10 to 40%, preferably from 15 to 25%.

[0049] The coated pieces may then be finally dried down to a residual water content of 3% or less, preferably 2% or less.

Preparing the binder

[0050] As a whole, the binder may comprise, in parts by weight, from 10 to 70 parts of sugars, from 5 to 30 parts of humectants, from 5.5 to 27.5 parts of milk solids non fat, from 10 to 35 parts of milk fat and/or vegetable fat, up to 10 parts of cocoa powder, up to 5 parts of emulsifier and added water up to a water content of from 5 to 15%, for example.

[0051] The binder may be prepared by mixing together its dry components in powdered form with its fluid components in liquid form.

[0052] The possible milk solids may be incorporated into the binder in form of fresh milk, of condensed milk and/or of milk powder, for example.

[0053] Water may be added as such, as water contained in condensed milk or as water contained in fresh milk, for example.

[0054] Sugar may be added as such and/or as sugar contained in sweetened condensed milk, for example.

[0055] A preferred binder comprises condensed sweetened milk, in an amount of from 20 to 45 parts by weight, for example. In this case, the binder may be prepared by mixing the components in a double walled tank while heating to a temperature of from 105 to 117°C, thus concentrating the mixture up to a dry matter content of from 80 to 95%, preferably of from 90 to 92%, and then cooling down to a temperature of from 33 to 80°C, for example.

Mixing particles and binder

[0056] A dry mix of particles may be prepared and mixed with the binder in a flowable state, namely at a temperature such that its fat components is in a liquid state, especially at a temperature of from 33 to 80°C, for example.

[0057] Mixing particles and binder may be carried out by means of any gentle, especially continuous mixer which does not damage the cereal particles, such as a screw mixer of the helical spring type with an axial sprinkling nozzle, a coating drum or a paddle mixer, for example.

[0058] The dry mix and the binder may be mixed at a rate of about 40 to 70 parts by weight of dry mix and about 60 to 30 parts by weight of binder, while optionally adding thereto additional cereals, fruits having an adequate water activity (Aw) or nuts, for example.

[0059] The mass thus obtained preferably has an Aw of from 0.1 to 0.5 (water content of from 1 to 7%), and more preferably an Aw of from 0.1 to 0.3 (water content of from 1 to 3%).

Shaping the bar

[0060] The flowable mass obtained above may be formed into a bar shape by sheeting-cutting, sheeting-moulding, moulding or pressing through an opening and

cutting, for example.

[0061] The ready-to-eat food bar may then be coated with a sweet coating such as a chocolate coating or a coating reminiscent of white chocolate such as a mixture of a milk powder and fat, for example. The thus coated bar may finally be provided with any decorating usual in the confectionary art, for example.

[0062] The ready-to-eat food bar may be conditioned in a packing providing for its protection against humidity, such as a packing made of a film with aluminium foil, or a metallised foil, for example.

[0063] The following examples are given as illustration of embodiments of the ready-to-eat food bar and of the process for its manufacture according to the present invention. The parts and percentages are by weight.

Example 1

[0064] For manufacturing a ready-to-eat food bar comprising particles of a cooked-extruded wheat base, a mixture was first prepared which had the following composition, (in parts, except added water):

wheat flour	41
wheat starch	18
oat flour	9
wheat bran	9
calcium carbonate	0.5
added water, up to a water content of	19%

[0065] For preparing the mixture, the powders were first mixed together to obtain a dry mix. The dry mix and added water were then mixed together in the extruder. The mixture obtained in this way was cooked-extruded-expanded with the aid of a BC-45H type CLEXTAL twin screw extruder having a screw diameter of 55 mm and a total processing length of 800 mm.

[0066] Cooking-extruding was carried out at 150°C under 100 bar for 30 s, the two intermeshing screws rotating at 300 rpm. The cooked thermoplastic mass obtained in this way was extruded through a die having eight circular openings 3 mm in diameter.

[0067] The thermoplastic mass was extruded into ambient air and immediately cut with a two blade cutter rotating adjacent to the opening at 2000 rpm.

[0068] The particles of cooked-extruded-expanded wheat base obtained in this way expanded after cutting so that they were about 5 mm in diameter. They had a water content of 10.6%.

[0069] The particles were then dried with hot air on a belt dryer to a residual water content of 2.9%.

[0070] The dried pieces were coated with a sugar solution in a tumbler.

[0071] The sugar solution comprised 59% sugar, 10% dextrose, 1% oil and 30% water.

[0072] The amount of sugar solution used was such

that the weight proportion of coating on the coated pieces was 20%.

[0073] The coated particles were then finally dried down to a residual water content of 2%.

[0074] A blinder was prepared which had the following composition (parts) :

skim milk powder	12.5
glucose syrup	9.4
sorbitol syrup	7.2
invert sugar	11.5
condensed sweetened milk (29% water, 43% sugar)	33.5
sodium chloride	0.3
hydrogenated vegetable fat (melting point 39°C)	13.4
mixture of vegetable mono- and diglycerids	0.6
Glycerine	6.7
Water	5.0

[0075] For preparing the binder, the components were mixed together in a double walled tank while being heated to 114°C until the mixture was concentrated up to a dry matter content of 91%. The binder was then cooled down to a temperature of 75°C.

[0076] 50 parts of particles of a cooked-extruded wheat base and 50 parts of binder were gently mixed by means of a mixer of the helical spring type.

[0077] The mass thus obtained was formed into a bar shape by sheeting down to a thickness of 1 cm and cutting individual bars 3 cm in width and 10 cm in length.

[0078] The bars had a water content of 5.3% and an Aw value of 0.35.

[0079] The bars had a soft texture while retaining the crunchiness of the cooked-extruded-expanded wheat base. They had an appetizing taste and could be eaten as they were. They were nutritionally valuable, each individual bar representing a complete meal just as it was.

Claims

1. A ready to eat food bar consisting of agglomerated particles of one or more cooked cereal bases mainly comprising amylaceous materials and possibly milk solids which are coated with a binder mainly comprising sugars, milk solids, humectants and fat.
2. Food bar as claimed in claim 1, comprising, in % by weight, from about 4 to 12% of protein, from about 50 to 80% of available carbohydrate and from about 2.5 to 25% of fat.
3. Food bar as claimed in claim 1, comprising, in % by weight, from 5.5 to 27.5% of milk solids non fat, from

2.5 to 25% of milk fat and/or vegetable fat, from 30 to 60% of amylaceous material, from 5 to 30% of sugars, from 2.5 to 15% of humectants and from 1.0 to 7.0% of residual water.

4. Food bar as claimed in claim 1, which has an Aw value of from 0.1 to 0.5.

5. A process for manufacturing a ready-to-eat food bar, consisting of preparing a dry mixture of particles of one or more cooked cereal bases mainly comprising amylaceous materials and possibly milk solids, mixing the dry mixture with a binder mainly comprising sugars, milk solids, humectants and fat and forming the mass thus obtained into a bar shape.

6. A process as claimed in claim 5, in which the particles of cooked cereal bases are rolled cereals, gun puffed grains, cereal flakes and/or cooked-extruded cereals.

7. A process as claimed in claim 6, in which cooked-extruded-expanded cereals are prepared by cooking-extruding-expanding at 120 to 170°C under 40 to 160 bar for 5 to 50 s a mixture comprising, in parts by weight, up to 27.5 parts of milk solids non fat, up to 12.5 parts of milk fat and/or vegetable fat, from 50 to 90 parts of amylaceous material, up to 12 parts of sugars, and added water up to a water content of from 11 to 19% by weight of the mixture, thus obtaining a rope of a thermo plastic mass having a porous texture, cutting the rope into pieces and optionally drying them.

8. A process as claimed in claim 7, in which the dried pieces are then coated with a sugar solution and dried again.

9. A process as claimed in claim 8, in which the sugar solution comprises from 50 to 60% sugar, from 3 to 10% dextrose, from 0.5 to 1.5% oil and from 10 to 40% water.

10. A process as claimed in claim 5, in which the binder comprises, in parts by weight, from 10 to 70 parts of sugars, from 5 to 30 parts of humectants, from 5.5 to 27.5 parts of milk solids non fat, from 10 to 35 parts of milk fat and/or vegetable fat, up to 10 parts of cocoa powder, up to 5 parts of emulsifier and added water up to a water content of from 5 to 15%.

11. A process as claimed in claim 10, in which the possible milk solids are incorporated into the binder in form of fresh milk, of condensed milk and/or of milk powder, and the binder comprises condensed sweetened milk in an amount of from 20 to 45 parts

by weight.

12. A process as claimed in claim 11, in which the binder is prepared by mixing the components in a double walled tank while heating to a temperature of from 105 to 117°C, thus concentrating the mixture up to a dry matter content of from 80 to 95% and then cooling down to a temperature of from 33 to 80°C.

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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 1548

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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 00 20 1548

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26-09-2000

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